

Item	<u>1.5</u>		<u>2.5</u>		<u>2.5</u>		Components	3		Regulation
	DVdd1	Pd	DVdd2	Pd	Avdd	Pd	Psub_total	Itotal	Ptotal	Efficiency
Xilinx i/o	0.00		0.20	0.5	0.00		0.5	0.20	0.60	83%
Xilinx core	0.33	0.5	0.00		0.00		0.5	0.33	1.00	50%
ASIC			0.00		0.08	0.2	0.2	0.08	0.24	83%
ADC	0.00		0.00		0.20	0.5	0.5	0.20	0.60	83%
							<b>1.7</b>	<b>0.81</b>	<b>2.44</b>	<b>70%</b>
							Watts	Amps	Watts	

Wire guage    Ohms/meter

26	0.134
24	0.0842
22	0.053
20	0.0333
18	0.0209
16	0.0132
14	0.00829
12	0.00521
10	0.00328
8	0.00206
6	0.0013
4	0.000815
2	0.000515
0	0.000322

Total FEB current	Distance	Wire gauge	Ohms/meter	Each side		Total	
				$\Delta V$	Cable Pd	$\Delta V$	Cable Pd
1.00	4	26	0.134	0.536	0.536	1.072	1.072
		24	0.0842	0.337	0.337	0.674	0.674
		22	0.053	0.212	0.212	0.424	0.424
		20	0.0333	0.133	0.133	0.266	0.266
		18	0.0209	0.084	0.084	0.167	0.167
		16	0.0132	0.053	0.053	0.106	0.106
		14	0.00829	0.033	0.033	0.066	0.066
		12	0.00521	0.021	0.021	0.042	0.042
		10	0.00328	0.013	0.013	0.026	0.026
		8	0.00206	0.008	0.008	0.016	0.016

Feeder cable							
Total FEB current	Distance	Wire gauge	Ohms/meter	$\Delta V$	Cable Pd	$\Delta V$	Cable Pd
64.00	4	12	0.00521	1.334	64.020	2.668	128.041
		10	0.00328	0.840	40.305	1.679	80.609
		8	0.00206	0.527	25.313	1.055	50.627
		6	0.0013	0.333	15.974	0.666	31.949
		4	0.000815	0.209	10.015	0.417	20.029
		2	0.000515	0.132	6.328	0.264	12.657
		0	0.000322	0.082	3.957	0.165	7.913

### Power Distribution Boxes

- One Power Distribution Box is located next to each Combiner
- The PDB GND and Combiner GND are connected together on adjoining boxes
- Common PDB/Combiner GND are connected to Utility Mains GND by copper cable or braid.
- Bulk Power Supplies are floated at their source. Thus, the negative terminals will be below ground by the amount of voltage drop in the Vdd\_Return line
- Common GND braids carry no current, hence have no voltage drop
- Diagram shown is for detector top. The sides will have a somewhat different (and longer) cable configuration.

### Power Distribution to Front End Boards

- Individual cable from PDB to each FEB
- DAQ cables do not carry a GND signal. If they wind up being shielded, the shield can be ac coupled at the FEB.
- Assumption : Total FEB current  $\leq 1$  Amp (not counting TE Cooler)
- Power cables will vary in length between  $\sim 1$  m – 4 m
- Wire gauge is TBD, however an 18 gauge wire results in worst case 84 mV drop in Vdd and Vdd\_return lines. A 16 gauge cable results in worst case 53 mV.
- Individual FEBs have their own board ground (FEB\_GND) which are connected to Vdd\_return on their own power cables. These local grounds will be above the Utility Mains GND potential by an amount equal to their individual cable drop in their Vdd\_return lines.
- Common mode voltage of all LVDS lines will be shifted by the ground drop voltage.
- Drop in Vdd lines has no effect on LVDS common mode voltages due to local regulators.

### TE Cooler Power

- TE Cooler Power to be run on separate cable.  $V_{TEC}$  &  $V_{TEC\_Return}$
- $V_{TEC\_Return}$  is not connected to FEB\_GND at the FEBs. This is to insure that TE Cooler return current does not cause unwanted transients on the FEB.
- TE Cooler cable to be sized according to specific TE cooler. Tolerance to line drop, particularly in the return line depends on details of the TE cooler control circuit.

